The American Biology Teacher

A service publication of
The National Association of Biology Teachers
teaching the life sciences from elementary grades through college

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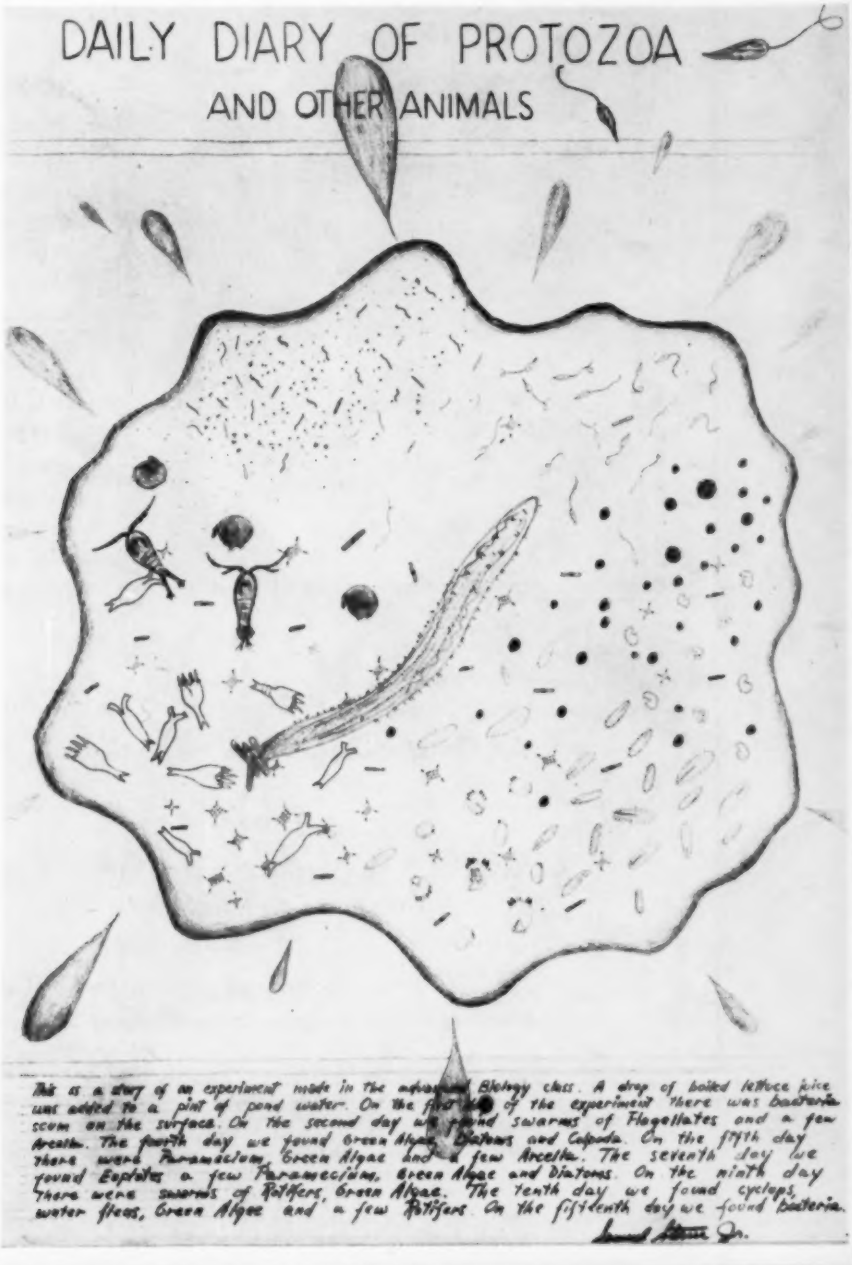
Common Invertebrates

Busman's Holiday

Vol. 14, No. 8


DAILY DIARY OF PROTOZOA
AND OTHER ANIMALS
This is a story of an experiment made in the advanced Biology class. A drop of boiled lettuce juice was added to a pint of pond water. On the first day of the experiment there was bacteria scum on the surface. On the second day we found swarms of Flagellates and a few Arcella. The fourth day we found Green Algae, Diatoms and Copoda. On the fifth day there were Paramecium, Green Algae and a few Arcella. The seventh day we found Euglena, a few Paramecium, Green Algae and Diatoms. On the ninth day there were swarms of Rotifers, Green Algae. The tenth day we found cyclops, water fleas, Green Algae and a few Rotifers. On the fifteenth day we found bacteria.

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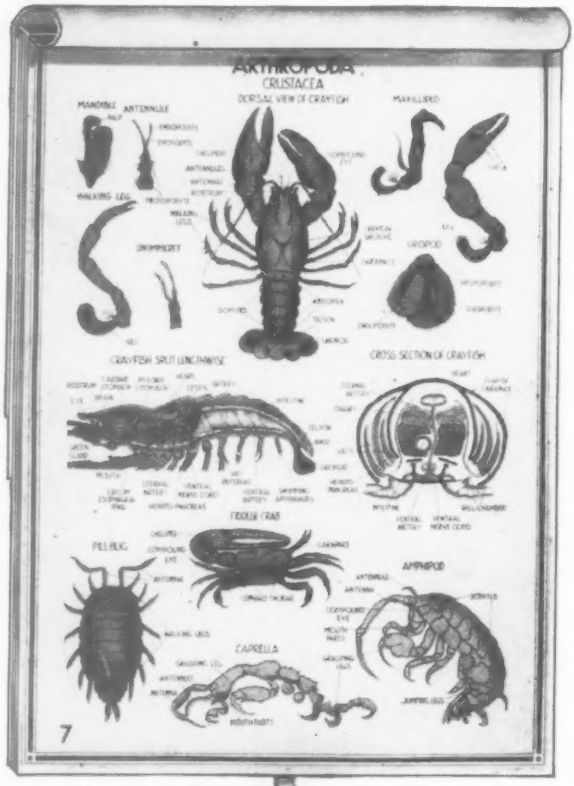

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THE COVER PICTURE

was drawn by Samuel Stover, Jr., while he was a 10th grade student at Oroville Union High School, Oroville, California. The project for which it was drawn was under the direction of Miss Enid A. Larson, author of this month's lead article, on page 205. After Mr. Stover's graduation from high school he attended the San Francisco Art Center, and he is now the art director for the Electrical Products Corporation of Sacramento, California. He says that the opportunity to express his ideas through art in biology was one stimulus in helping him choose a career.

The American Biology Teacher

Vol. 14 DECEMBER, 1952 No. 8

Revealed by the Microscope

together with

A Simplified Key to Some Common Freshwater Invertebrates

ENID A. LARSON
Carmel High School, Carmel, California

Since the days of Leeuwenhoek, observers have experienced a thrill in exploring the unknown with the microscope. Today, no less than in 1677, when the first microscopic life was seen with that simple but crude instrument, the student of biology can have the thrilling experience of rare adventure in discovering for himself this invisible world of plant and animal life.

In setting up our life science course we have thought that no biology class is complete without providing the students an opportunity for first-hand exploration with the microscope. In our Advanced Biology classes, we have developed a "freshwater biology" unit. In this unit the student collects his own samples of pond water, becomes acquainted with simple techniques of protozoological culture methods and learns to recognize some twenty invertebrates. He observes behaviors and reactions of animals, their ways of life, and above all else, gains a knowledge of the close interrelationships of living plants and animals. Food requirements of several of the animals can be demonstrated readily. The sequence of life in a jar of pond water to which organic substance (bits of lettuce, dry alfalfa, or fresh grass) has been added is a source of unending amazement to the student. The importance of bacteria in this sequence is forcibly demonstrated.

The entire unit is directed toward the goal of giving the student an opportunity to see living plants and animals in a natural environment. An attempt is made to find first-hand information on the following biological problems for each organism:

1. What is its method of locomotion?
2. What is its food?
3. How does it eat?
4. How does it adapt itself to changes in its environment?
5. How does it react to stimuli?
6. How does it reproduce?

Laboratory equipment for this unit is simple. It includes an aquarium, a microscope, slides, cover glasses (#2 thickness) and pipettes.

In a class, two students can work very well with one microscope if individual equipment is not available. To supplement this, and for group observation and discussion, we find the microprojector a most valuable and indis-

Hollow glass block aquarium for individual use.

pensable aid. The individual aquarium may only be a gallon jar, or a hollow glass brick which retails for approximately $1.50.

At the conclusion of a few weeks of observation and simple experimentation with control set-up, the student is invited to prepare a written summary of his work. This summary may be illustrated if the student desires. Original creative expression is welcomed. In the summary, expressed by whatever means the student has chosen, emphasis is placed upon factual expression and accurate observation.

The cover illustration was worked out by a student who was interested in expressing his story visually. Just how to draw "a drop of water" puzzled him for several days. The results of his efforts were artistically pleasing and an expression of accurate observations. He neglected in his brief explanation to add, that in order to repeat the sequence of life, more culture medium had been added. This addition to his culture was then followed by the rapid growth of bacteria.

As a teaching device, this type of summary has much to be said in its favor. It allows the student a chance for individual creative expression in whatever medium he chooses; it allows for play of imagination which is so essential in scientific work; it emphasizes the need for accuracy of observation and expression in precise terms; it shows up vividly and quickly any erroneous concepts or misinformation which may need to be clarified.

The Simplified Key was worked out by the teacher in answer to students' questions. It was designed to meet an actual classroom need. Unhappily, there was no such key available for identification of common freshwater invertebrates which was within the vocabulary range of a high school student. Although it has its faults due to simplification, this key has been successfully used for six years, by many students in the classroom, without teachers' aid. At the beginning of the unit it is emphasized and re-emphasized that a key is a tool. The name of the plant or animal is secondary to finding out what the animal is doing, its behavior and its habitat requirement.

The following directions are given for the use of this Key, after the vocabulary has been examined and each student has prepared a glossary of terms for his own use.

Directions:

1. This Key is based on structures or behaviors of animals which you can see.
2. It is a device for unlocking one door of knowledge.
3. The purpose in using the Key is to determine a name for an animal or for the group to which it belongs.
4. To use the Key, choices must be made by the student. You must determine whether the animal is like A or AA; then proceed to the next choice, B or BB.
5. A name in italics is a genus name.
6. A name in capital letters is an order name or a common name.

Pleasure in using this simplified key is unbounded when the student finds that by his own effort he can learn to recognize and identify with a high degree of accuracy these inhabitants of the microscopic world.

Simplified Key

To Some Common

Freshwater Invertebrates

A. Animals whose bodies are one cell .. PROTOZOA
B. Protozoa with special structures for locomotion; usually seen swimming rapidly through the water.

C. Protozoa swimming by means of 1, 2, 3, or 4 long whip-like hairs (flagella). Locomotion slow. MASTIGOPHORA

D. Body spindle shape; with chloroplasts; appears deep green in color. One flagellum. *Euglena*

DD. Body without chromatophores. A single flagellum, rigid except near tip; at tip, flagellum looks like a coiled spring ..... *Peranema*

DDD. Body without chromatophores. Two flagella. Cytoplasm yellowish, translucent. Anterior end with a notch, from which the flagella extend ..... *Chilomonas*

CC. Protozoa swimming by means of hairs (cilia). Locomotion very rapid. INFUSORIA

E. Cilia very fine, evenly distributed over body; arranged in long rows or in a band around body. Animal swims in spiral rotations. Locomotion smooth, never jerky.

F. Body bell-shaped or trumpet-shaped; cilia conspicuous in a band around edge of bell or trumpet. Animal often attached to debris.

G. Body bell-shaped with contractile stalk.

H. Stalks with a single individual. Animal often breaks from its stalk. *Vorticella*

HH. Stalks branching with several individuals. *Carchesium*

GG. Body trumpet-shaped, often blue in color. Cilia in longitudinal rows, and around edge of trumpet leading to mouth .... *Stentor*

FF. Body not bell-shaped; cilia never in a band but evenly distributed in longitudinal rows.

I. Body slipper-shaped.

J. Long groove in side of body leading to mouth. *Paramecium*

JJ. Without groove in side of body. Cytoplasm with vacuoles often filled with algal cells or filaments of algae. *Frontonia*

II. Body bean-shaped. *Colpoda*

EE. Cilia coarse, not evenly distributed but arranged in groups or "tufts" (cirri); these cirri are used for walking as well as swimming. Locomotion jerky.

K. Body shovel-shaped, flattened, with large "V" leading to mouth; with stain, cell shows a nucleus in long "E" shape. *Euplotes*

KK. Body not shovel-shaped, more elliptical; two nuclei when stained. *Stylonychia*

EEE. Body cilia reduced. A central girdle of long bristle-like cilia. Locomotion by jumping. *Halteria*

BB. Protozoa moving slowly by creeping. No special structures for swimming. Locomotion entirely by pseudopodia. Often found in scum at top of jar .. SARCODINA

L. Body assuming irregular shapes, no definite form; one nucleus when stained; protoplasm without any covering ..... *Amoeba*

LL. Body spherical, disc-like or doughnut-like; with shell-like covering; two nuclei. Usually brownish in color. Pseudopodia seldom seen. *Arcella*

LLL. Body spherical, many radiating, spine-like rigid pseudopodia. Cytoplasm highly vacuolated. *Actinophrys*

AA. Animals whose bodies are made up of many cells ..... METAZOA

a. Body worm-like; may or may not have a distinct exoskeleton or protective covering (cuticle).

b. Body flat, without external covering; not segmented.

c. With eye spots.

d. Body without pigment. Usually creamy white. *Dendrocoeleum*

dd. Body with pigment spots. Usually black, purple, or grey. *Euplanaria*

cc. Without eye spots. Body ciliated, usually with attached buds; ciliated pits present.

e. Posterior end tapering to a sharp point .... *Stenostomum*

ee. Posterior end blunt. *Microstomum*

bb. Body cylindrical, very transparent. A cuticle present. Internal organs

visible.
f. No distinct head, no segmentation, with transparent cuticle. A thread-like worm; very active.
NEMATODES
ff. Head distinct; usually partially or completely segmented. Swims or creeps.
g. Body with cilia; cylindrical or as a flattened cylinder.
h. With two wheel-like rotating ciliated coronas at anterior end around mouth; body very contractile, has adhesive toe or toes by which it attaches itself.
Rotifera
hh. Without rotating coronas at anterior end. Body divided into distinct regions —*head*, *neck*, and *body*. Dorsal surface covered with plates, hooks, or bristles. Bristles about the head and mouth. Cilia on ventral surface. A graceful swimmer. Easily confused with Protozoa.
GASTROTRICHA
gg. Body without cilia.
i. Body segmented but not divided into distinct regions. Segments equipped with setae (bristles) .. ANNELIDA
j. With gill-like respiratory organ at posterior end.
k. Respiratory organ with two long processes .. *Aulophorus*
kk. Respiratory organ without long processes ..... *Dero*
jj. Without gill-like organ at posterior end.
l. With bright ruby red, green, or yellow droplets throughout the body .... *Aeolosoma*
ll. With long, tube-like proboscis at anterior end ..... *Stylaria*
ii. Body segmented, always divided into distinct regions; air tubes or gills present.
m. Usually with three pairs of jointed appendages.
INSECT LARVAE
aa. Bodies not worm-like; with a definite exoskeleton; with jointed paired appendages.
CRUSTACEA
n. Body not visibly segmented.
o. Body, head, and feet completely enclosed in an *opaque* bi-valve shell; only those appendages used for swimming may be readily seen. Oval in outline ..... OSTRACODA
oo. Body and feet only enclosed in a bi-valve *transparent* shell; head distinct; compound eyes and eye spots present; antennae always branched, usually feather-like.
CLADOCERA
p. Antennae free (not covered), used for swimming.
q. Head joined to body without any indentation.
Daphnia
qq. Head joined to body with deep notched V-shaped indentation.
Ceriodaphnia
pp. Antennae covered; rostrum beak-like; head very small.
Chydorus
nn. Body segments distinct.
r. Head and thorax joined (cephalothorax), distinct from abdomen; many appendages.
s. With antennae. Many paired legs for swimming .. COPEPODA
t. Antennae short, not longer than cephalothorax; with 6–17 segments in each antenna. Ruby red eye-spot in center of head. Body colorless ..... *Cyclops*
tt. Antennae long; as long or longer than body; with 23–25 segments. Body reddish-orange color ... *Diaptomus*
ss. Without antennae. 4 pairs of walking legs. Abdomen globular; difficult to distinguish from the cephalothorax.
WATER MITES
rr. Head, thorax, abdomen distinct. 3 pairs of appendages joined to thorax; with trachea (air-tubes) and/or leaf-like gills at the tip of abdomen ..... INSECT LARVAE

Rotifera: The common rotifers which we have found in our aquaria belong to the genera *Furcularia*, *Rotifera*, *Brachionus*, *Floscularia*, and *Philodina*.

Protozoa: Of the ciliates not included in the Key the following genera are frequently encountered: *Cyclidium*, *Lionotus*, *Loxodes*, *Loxophyllum*. *Spirostomum* may come up in great numbers especially after a fish has died in an aquarium.

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Biologists Are Curious

HELEN FIELD WATSON
Senior High School, Mitchell, South Dakota

A scientist must be curious. He must ask questions of things and about things. So while my students are carrying on their studies and experiments and making observations, I have made some observations about my students. These high school biology students are sophomores, about fifteen years old.

Here are some of the questions I have been trying to answer:

I. *Why do indifferent students (those who have D and F grades) have more absences than the high-ranking students (those having A and B)?*

Or do they? Are the absences necessary? Are they a contributing cause to the poor work? Or, is lack of purpose the cause of the frequent absences?

For eight years I have been trying to answer these questions. Each year we have from 110 to 120 pupils taking biology. Each year that means 30 to 35 A or B students and as many with D or F.

Each year the low-rating group averages from 2 to 3 times as many absences as the top-ranking group. I have the data on this for eight years.

Quoting from the Caldwell-Lundeen studies: "Large numbers of individuals of the same age have been divided into two groups on the basis of their intelligence or capacity for learning. It has been found that the most intelligent groups are not only slightly superior in desirable physical traits but also in other desirable traits such as character, disposition, artistic ability, interest, and ability for different kinds of skills. . . . On the average, among large groups of people, all desirable traits tend to be associated with each other." Is the first part of this statement the answer, that the poorer group mentally have poorer health?

Or does the poor attendance stem from lack of purpose—lack of stick-to-it-iveness? Is it easier for those with less interest in life to find excuses for staying away from school?

Or do parents of ambitionless students urge the absences, reasoning that if the son or daughter is not inclined to work he might as well be helping at home?

I do not know the answer. Many articles have been written about this problem, but scientists do not make hasty conclusions. The fact remains that absence from school has a definite correlation with the quality of work done.

It is also a fact that people cannot be averaged; each person differs from every other.

II. *Are young people literally hot-blooded?*

In our elementary biology classes temperatures of all students are taken. This is done so that each one may learn the use of the clinical thermometer. The data now include temperatures for over 300 young people, ages 14 to 16. In comparison with "normal" body temperature of 98.6 the average for these 300 students is 98.3. The average for 65 students in the 3:00 to 4:00 o'clock groups is only 98.49. Not a fifth of these young people can get the thermometer to register as high as normal—at least, in the daytime.

III. *When are young people grown up?*

That question refers to growth in height. Certainly the data in connection with the growth of 15- or 16-year-olds are too varied to be of value. It seems to be generally agreed that the age at which one acquires full height, or at which he makes his spurts in height, is inherited. One boy is short at 18 and will grow later, while another boy is through growing at 15 years. In our biology laboratory we have recorded heights over 8-month periods for students in their fifteenth year. One year 46 boys averaged 1 inch growth in the 8 months, while the girls averaged ¼ inch in the 8 months. It is interesting to note that three

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boys gained 2½ inches in two-thirds of a year, while no girl gained more than an inch. One year the shortest boy gained 3¼ inches in the 8 months. This fits in with the common belief that girls are nearly through growing by the sixteenth year.

IV. *What is the frequency of colorblindness?*

For several years a test for colorblindness has been given in our biology laboratory, but this is now done in the Driver Education course.

I have never found a color-blind girl.

Of color-blind boys there are usually 4 or 5 among the 55 or 60 taking the course. This seems a bit high since in the general population (according to the usual data) the average is 1 color-blind boy in 25, and one color-blind girl in 250.

V. *Do most folks know that man has more than five senses?*

We have been trying to teach-down that old misleading statement, "the five senses."

At one of the local theaters, one evening, one of our biology students in attendance asked ten patrons, "How many senses does man have?" Of the 10 persons, 8 answered confidently, "Five." One said, "More than five." One named eight of them. Majorities are not always reliable.

VI. *Do young people like noise?*

Do they like it continuously, spasmodically, or infrequently? Do some like it and others not? Or is noise merely a cover-up for not knowing how to converse, or how to sit quietly with poise? Of course this article is not answering those questions.

Each fall near the opening of our biology course each pupil writes a page or so of description of the "spot out-of-doors" which he enjoys most, and is asked to tell why he likes it. He is told that it may or may not fit in with biology. Usually he ties back to a summer vacation. It is significant that only three persons of more than five hundred have described participation in a sport or even being a spectator. The reason given most often for liking the place is—as it would be for an adult—"the peacefulness," "the quiet," the "being alone to think," "the hush."

We adults often forget that young people have few wide acres for roaming, few woods through which to shuffle in autumn leaves, few barn lofts, few attics, and, because many families live in small apartments, the chance of a boy or girl ever being alone is meager.

Perhaps young people do not differ so much from adults as each person differs from himself at different times. We all like noise at times, and we all like the hush of evening far from the chance of interruption. We all want to live serenely. Man differs from youth to age less than he differs from hour to hour.

VII. *What do young people fear most?*

An interesting questionnaire for biology students comes up in connection with our work on the nervous system. It is an attempt to find the most common causes of fear in youth. Even though the questionnaires are unsigned it is probable they do not mention their worst fears. Several students do sign their names having been reminded that sharing a fear may help to erase it.

The fears mentioned most commonly are: darkness, accidents, sickness, death. But these fears seldom enter into their dreams.

Their most common sorrows are: death or illness of grandparents, parents, or other members of the family; divorce or quarreling of parents; loss of a friend; loss of a pet. Other sorrows are mentioned much less often. And these sorrows seldom enter into their dreams.

For most young people dreams are usually pleasant.

VIII. *What do young people consider the purpose of life?*

This question has been asked for three years. Some do not answer it, perhaps never having thought of life as having a purpose, or having thought much about it but found it too profound a question to answer.

One year 63% said in one manner or another the purpose was to get ahead, to have a good time, to get enough education to get a good job, to earn money. But 20% answered

that they owed a service to others, and some included self with others, so that at least a third of them recognized an obligation to mankind. This year the proportion is larger.

From these groups may yet come a St. Francis, a Savonarola, or an Albert Schweitzer.

IX. *Which unit of work studied during the high school biology course is "most interesting and seemingly will be most helpful" to students?*

It might be expected that the choice would be an easy unit with many films, field trips, spring specimens in the laboratory as in Conservation of Natural Resources, or one with laboratory experiments as The Human Nervous System.

But the majority do not choose these units. Their choice is Genetics. That three weeks unit always gets the largest vote. For second place frog dissection and general human physiology tie in interest. In fact, frog dissection is used as an introduction to the human body by comparing like organs and functions and noting differences in location, size and function.

To quote Chesterton, "There is nothing like so interesting to ourselves as ourselves."

Data about groups of people are interesting and often helpful. But if an article of this nature leads us farther from the individual student it is worse than useless. There is no average person. There are trends. And we biologists are curious.

A Busman's Holiday

Editor, *The American Biology Teacher*
State Teachers College
Emporia, Kansas

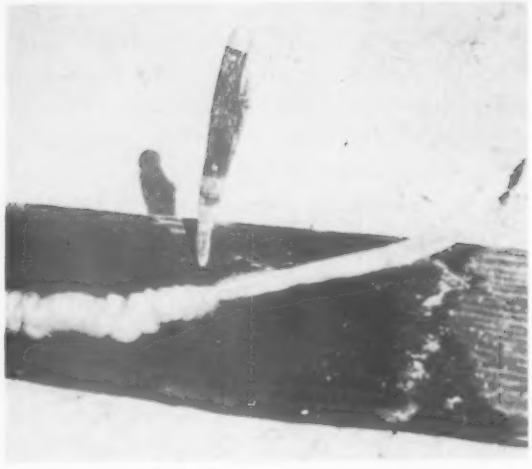
Dear Mr. Breukelman:

Perhaps your readers might enjoy hearing of the "busman's holiday" of a parasitologist. If you can use this letter (and the accompanying photos), please do so. I feel that it contains information "what caused the death of the porpoise?" of some value, and I should like to share my speculations with others.

On June 13, 1952, early walkers along the beach at Pawley's Island, South Carolina, noticed a dying or dead porpoise stranded in the breakers. I saw it at 8:00 o'clock.

It was a nine-foot specimen, with no external signs of injury, although its skin was marked by the ineffectual bites of sharks. These marks were extensive, but not one of the bites had penetrated more than the pigmented outer layer of the skin.

Several friends who knew of my professional interest (in intestinal worms) began to speculate on what parasites the porpoise might have. With some reluctance I decided to examine it for intestinal parasites. Using a pocket knife (I was theoretically on vacation, without equipment), I made an eight-inch incision in the right belly, and, reaching into the cavity, began to pull out the intestine. Incidentally, the porpoise was still quite warm inside, although not living. After surprising amounts of intestine lay rolling in the surf around my feet, I cut the attachments at stomach and colon, as well as the large vessels and mesenteries, and carried the slippery arm-



ful up on the beach. There I straightened it out by trimming the mesenteries still more, finally laying it in a line that reached about 100 feet, a discouraging sight, indeed, to one accustomed to searching the intestines of small birds!

I proceeded to slit the intestine, several inches at a time, keeping near me for specimens a glass jar into which I had collected a moderate amount of the rather clear fluid content of the ileum. After scraping the mucosa carefully, and examining the opened regions in the bright sunlight, I worked slowly from one end of the intestine to the other. Parasites seemed rather scarce: only in the last six to ten feet, in the duodenal region, did I find any. These were several kinds of trematode and one nematode, about seventy worms in all. After transferring them to the specimen jar, where they stayed alive, I took them back to my cottage and there preserved them in weak formalin (the only collecting equipment I had with me). I have not yet attempted to identify the parasites.

I did make one observation of considerable interest concerning the intestine of the porpoise. In a region approximately ten feet from the ileo-coecal junction there occurred an intussusception (see photograph). This condition, in which the intestine is partially telescoped, is not uncommon in man. It must be promptly relieved by surgery, or necrosis of the telescoped portion may occur, causing blockage and perforation of the intestine, peritonitis, and death. Obviously, surgical relief had not been available to the porpoise of Pawley's Island. Although its intussusception had not yet broken, the inner portion was badly eroded and weakened, appearing only as a thin, transparent membrane. The lumen seemed to be blocked by the contraction of the outer portion around it. I think it likely that digestion had been interfered with, and the porpoise may indeed have died of this condition. Perhaps its death was not directly due, however, to the intussusception. One may speculate that the weakened animal, unable to swim faster than the harrassing sharks which left their jaw marks so plainly upon it, finally fled to the shallows near the beach, where it was caught by the surf and stranded, there to die of exhaustion.

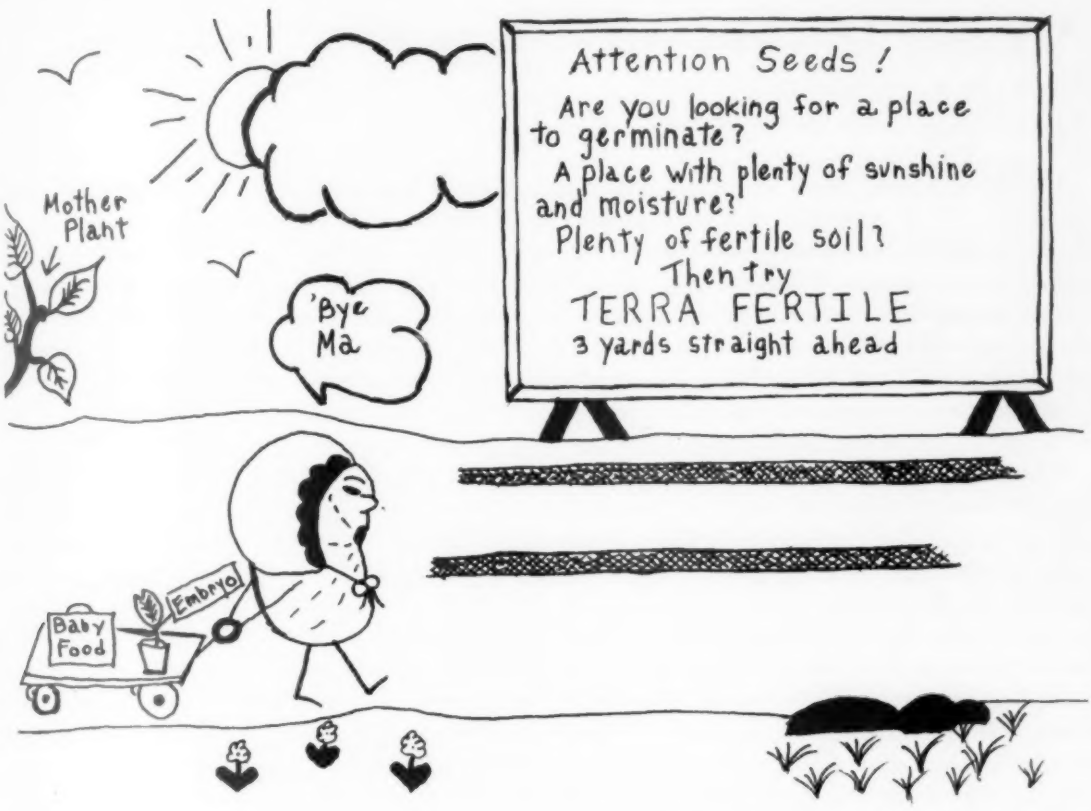
Perhaps I should record the remarks of some of the people who watched me as I inched along in the hot sun, face close to my work. Some were sympathetic, "Doesn't it smell awful!"; others somewhat in awe, "Do you get paid for doing that?"; and others healthily skeptical, "What's the point of lookin' for worms?" I still consider that my answer to the last, although somewhat intemperate, was apropos: "People have worms, too. Maybe you!"

Sincerely yours,

Arthur W. Jones,
The University of Tennessee,
Knoxville, Tennessee

Editor's Note: This issue of *The American Biology Teacher* is set with wider columns than we have used in the past; this is done to get more material on a page without reducing the size of the type. If you like this change let your editor know.

Cover Pictures. Thus far very few have been submitted, and most of those submitted have not been suitable for reproduction. Pictures must not be smaller than 7×10 inches, and should be on glossy paper. They should have plenty of contrast, for some contrast is lost in the process of engraving. When you send pictures, it will help if you include such data as type of film, kind of camera, exposure time, other exposure data, location or other circumstances.



Meyers High School
Wilkes-Barre, Pa.

Dear Dr. Breukelman:

Students in high school sciences so seldom catch hold of an idea or principle to the extent of making it their own, that one is delighted when something like the enclosed paper is handed in.

I had been trying to "put across" the business of dispersal in a way they could understand, but wasn't sure it was clear. Then—this came in, and I felt better!

If you can use it, all right. If not, allright too. It just "tickled" me so, I had to share it.

Sincerely yours,
RUTH A. MERREL,
Biology Teacher

P.S. The picture was drawn by Seymour Manello, tenth grade, E. L. Meyers High School, Wilkes-Barre, Pa.

ADVERTISERS COOPERATE

Members of NABT will be interested to learn that two of our advertisers have cooperated in our 1952 membership campaign.

We are indebted to Ward's Natural Science Establishment, Inc., Rochester 9, N. Y., for mailing 4,000 of our folders with their spring *Bulletin*. Ward's have also just completed the printing and folding of 25,000 membership folders, in two colors, for mailing in our autumn membership drive.

General Biological Supply House, Chicago 37, Ill., has helped promote NABT by publishing items of our news in two recent issues of their *Turtox News*. The August issue was mailed to 45,000 teachers of biology in more than forty countries.

An expression of appreciation should be made by NABT members to both Ward's Natural Science Establishment and to General Biological Supply House for their interest and help. Write to them and ask to be put on their mailing list.

MURIEL BEUSCHLEIN

A Visual Teaching Aid of Beauty and Usefulness

CHARLES E. PACKARD
Randolph-Macon College, Ashland, Virginia

Biology teaching assets will climb with the addition to one's collection of a chart entitled *Birds: Nature's Protectors*, compiled and furnished by Church and Dwight Co., Inc., 10 Cedar Street, New York City. Conservation is the keynote of this beautiful production which features 30 of the small copies of bird pictures which this company has long used as a delightful inclusion in its packaged products.

The miniatures are from the paintings by Louis Agassiz Fuertes and portray the following useful insect and weed-seed eaters: Baltimore oriole, barn swallow, black and white warbler, black-billed cuckoo, bluebird, brown creeper, brown thrasher, flicker, downy woodpecker, crested flycatcher, chickadee, cedar waxwing, black-throated green warbler, kingbird, bobolink, red start, northern yellowthroat, meadowlark, nighthawk, phoebe, purple martin, white-breasted nuthatch, vesper sparrow, song sparrow, scarlet tanager, rose-breasted grosbeak, robin, red-eyed vireo and the red-breasted nuthatch.

Nor is this the only biological inducement. Bordering the chart are figures of the larvae and adults of 41 insect pests enlarged sufficiently to form very good means of identification (though not to scale). Twelve colored reproductions of plant fruits and seeds with some in leaf and flower illustrate vegetable bird foods. A North American continent migration route plate, bird home measurement table, and representations of bird bath and winter feeding stations are also found on the face of this excellent wall adornment; bound at top and bottom by a metal strip with eyelet for proper hanging.

As if this were not enough in itself to warrant being a "must have" for one's teaching collection the backing of the 20×40 inch substantial paper chart contains 9 first-class lesson plans on the following topics: *Home and Family Life, Geography, Composition, Good Citizenship, Music, Nature Study, Arithmetic, Art, Plant Life*, and *Food and Nutrition*. All of these units center around birds and their protection. They are superbly conceived and executed. A well-chosen quotation prefaces each help. Then follows an introductory statement, an objective, suggestions for class discussion, activities, and pupil pursuits outside the schoolroom. This introduces a touch of the experimental method and scientific procedure.

A minimum of inconspicuous and inoffensive advertising of Arm and Hammer and Cow brands of soda, the bicarbonate for baking, long and favorably known to good cooks the nation over, accompanies the wealth of information which this fine visual aid affords. This educational service afforded by a producer of a pure and necessary product is in refreshing contrast with the purveyors of much propaganda inimical to the health and welfare of youth encountered in publicity media today.

The author was furnished with the chart through the recommendation of the Southern States Forestfire Commission of Birmingham 5, Alabama, whose worthwhile offerings to biology deserve to be brought to the attention of schools within their area. This group is alert to the resource-use needs of our country and has at its disposal many means for promoting the intelligent spread of information about the biological wealth and soil riches which we possess.

NEW NABT REPRESENTATIVE ON SCIENCE CLUBS OF AMERICA

Howard H. Michaud, Professor of Conservation in Purdue University, has been named on the Educational Advisory Committee to Science Service on Science Clubs of America. On this committee he represents The National Association of Biology Teachers. Mr. Michaud, a past president of NABT, has for seven years served as sponsor of the Indiana Junior Academy which has cooperated with Science Service in the state and national talent search programs.

The Scientific Method—Its Use at Various Levels of Science and in Science Teaching

ORVAL L. PETERSON
Graduate Student, The University of Washington, Seattle, Washington

Any consideration of The Scientific Method must be preceded by a clarification of the term which, of late, seems to have acquired a variety of meanings and interpretations. For sake of simplicity, and for more meaningful accuracy, I have come to think of The Scientific Method as that particular method of analysis which involves and requires the drawing of logical conclusions from data. Thus, application of The Method becomes limited somewhat to the many varied fields of science since, in a word, science is formulated data and ideas based on objectivity, while art is abstract formulation based primarily upon subjectivity and value.

There have existed, for many years, several recognizable levels of scientific activity. For example, probably the least technical level of scientific activity is that which I shall call the Descriptive Level. Analytical procedures at this level involve conclusions having been drawn from data derived from visual observations. Such data probably does not lend itself to testing and other forms of objective analysis as well as that of higher levels of science activity. None the less, it has proven itself of value. Much of Darwin's work might logically be considered descriptive in nature. Criticism of activity or work at this level is that such activity involves injection of the so-called "personal factor" into the scene. This frequently results in a certain amount of subjectivity and a lack of at least some objectivity being forced into the results of the investigation performed. The true Scientific Method, as I have defined it, does not operate most effectively at this level.

The second level of science activity is that which might be termed the Hypothesis Formation Level. Hypothesis formation of any type or description must by its very nature involve and utilize the mental processes of reason and logic, for it requires organization of the facts and conclusions previously drawn and derived through use of the scientific method of study. Thus, the hypothesis itself becomes more objective and lends itself better to tests for verification. It is through such verification that ultimately the laws of science are derived from the hypothesis.

By far the most important level of activity is that which is called the Experimental Level. It is at this level that modern science has made perhaps its greatest progress—progress which would have been largely impossible without the repeated and continuous use of the scientific method technique. We have used the Experimental Level to test the hypothesis and to form and test the laws of science. We have used it to apply these laws in practical ways. Its use has helped science to launch the Atomic Age. So widespread and continually used is this method, that today it has become a routine procedure in nearly all the work of virtually every field of scientific endeavor. Thus, the Experimental Level becomes more than the employment of a technique, for it involves, in addition, control and change which result in causal relationships of all descriptions. No science becomes of true practical importance until it becomes experimental and requires as its basis of approach, The Scientific Method.

What about the question of teaching the fundamental concept of The Scientific Method in the high school classroom? I suggest that the teaching of this method at best will be a slow and laborious process and, at present, it seems doubtful that it can be taught so completely and effectively that the student will comprehend its full meaning and applications. This seems partly due to the fact that the teacher's course must be feasible—it must be a compromise between what the teacher is expected to teach and what he would like to teach. Lack of time, overcrowded school

rooms, lack of facilities, and other factors are partially responsible for this condition. I am confident that the justification for the teaching of this method, as a standard method of problem-solving and investigative approach, lies in the real practical values it contains for the students.

The student who can acquire the ability to apply The Scientific Method toward the solution of problems he faces is at a decided advantage. The specific value obtainable from its use will be in direct proportion to the ability of the student to master its practical applications in the many types of difficulties he encounters in everyday life. Obviously, his understanding of The Scientific Method as a usable technique cannot come about from the mere ingestion of a few lectures or a few articles on the subject. Meaningful *use* and *practice* of the method by each student is *essential*. For the teacher who recognizes each student as an unique personality, and who tries to teach his students as individuals, the problem of adapting the method to best meet the individual's needs becomes great and the obstacles to be overcome difficult. The teacher can, in a very general way, make at least a beginning by utilizing one or more of the following techniques:

1. Provide students with a simple explanation of the scientific approach and its uses, and provide an opportunity for each student to practice the technique in simple ways.
2. Try to help students to make accurate observations, and group these observations into logical conclusions in a variety of situations and under a variety of conditions.
3. Try to have students work on a single specific problem and encourage them to analyze the problem, discover the facts involved, draw inferences, decide on a plan of action, and carry it out to its conclusion.
4. Encourage the development of a reasonable skepticism, based upon logical and orderly thinking, about all problems. Utilize the practice of constructive criticism and creative thinking. At the same time encourage tolerance and respect for others.
5. Try to develop in students the ability to see things in true perspective, and how to relate things to reality and practical living, that they may more effectively utilize their newly-gained knowledge of scientific procedures more advantageously.
6. Encourage use of The Scientific Method in solving problems encountered outside the classroom and in other classes.

The approach of college science in employing The Scientific Method has been centered upon its applications in research activities. This might be called the basic aspect of the method, for it is this approach which concerns itself with the discovery of facts and their ultimate organization into principles.

Secondary education should, it seems to me, concern itself more with the practical phases of the procedure. Students might well profit from applying scientific principles to practical problems of the classroom and real life, rather than unduly concerning themselves with concentration upon the learning of facts—facts which are often unrelated to the individual student's needs and impractical in application. It would, therefore, seem advisable that high school instruction place greater emphasis upon the practical side of science education. Since the large majority of high school students do not continue their formal education beyond the secondary level, it would seem logical to give them a usable technique which contributes to organized thinking and provides carry-over into many real life situations.

BIOLOGY LABORATORIES

By The Old Fossil

Animal of the month, a large-sized halftone picture of bulletin-board size, may be obtained free. The animal selected each month is, in the opinion of the experts at the Lincoln Park Zoo, most interesting, unusual, and appealing to zoo visitors. These posters are sent out monthly to schools throughout the nation who request them for use on their bulletin boards. Write to Charles E. White, Public Relations Department, The Quaker Oats Company, Merchandise Mart Plaza, Chicago 54,

Illinois. Please mention "The Old Fossil" when you write to Mr. White.

ZOOPARADE is a telecast of unexampled encyclopedic biological interest. Each program is built around the history, origin, habitat, life span, and other factors of animal life. Mr. White gave TOF a sumview of future television shows: "animals in stamps, coins, flags and emblems; animals in children's stories; the zoo veterinarian visiting the animals; and a test of your animal sense." These were a nuview of coming attractions for the spring. The program originates from Lincoln Park Zoo, Chicago.

YOU CAN PAINT WITH A PENCIL by Freer, N. Y., Studio-Crowell Publications, 1951. An illustrated text on how to use the broad stroke of a "carpenter pencil" (flat size 6B) to produce figures of animals and other biologicals of interest, price $2.50.

THEORY OF THE MICROSCOPE is a précis on the topic. There is much excellent material here which can be used by the general biologist and physicist. Quoting, "This booklet has aimed toward helping the microscope . . . . The aim has been to present the material in an interesting non-mathematical style." It may be obtained from the *Bausch and Lomb Optical Company*, Rochester 2, N. Y.; free.

TOF FAILED to mention trend observations of The International Livestock Show. It is primarily a cattle feeders show, swine and sheep are of secondary importance; and wheat, oats, and lesser grains, are "also rans." Lard type hogs are on the way out. These cannot compete with soy bean and cotton seed oils. Dairy cattle are not shown as their products do not market thru the stock yards.

LIFE'S VOCATION, as disclosed by Professor Butz of Purdue University, before the Illinois Agriculture Association for 1951, is sumviewed as follows. "There are prospects for reasonable earnings for farmers who are efficient, progressive, and scientific. For the long pull ahead, as a life's vocation, agriculture has as much to offer as any other comparable vocation to the young man who desires a comfortable standard of living for his family, good environment, and an opportunity to provide his own security for his declining days." It is an encouraging statement for this phase of our national economy. Farming, in the past, often has been taken very much for granted, yes, even tolerated or looked down upon by both the labor and white collar groups.

WASHINGTON HIGH SCHOOL in Milwaukee has a greenhouse. Mr. Jacque D. Vallier, chairman of the biology department, wrote TOF for a copy of *Greenhouse Techniques* mentioned quite some time ago. He stated: "I thought that perhaps this might augment such plans as I already have." I located a copy and sent it to Mr. Vallier. This was perhaps a record for delayed action. Time means little to fossils.

INDIANA TRAPPERS reported good catches last winter. Frank Martin, Fulton, a former student, living next door, is a night telegraph operator. He "runs" his 110 traps each morning. One week's operations produced over ninety pelts. Frank's best sales outlet is one of the large mail order houses. He places his traps along dredged ditches, but not in timbered country.

FOOD FOR YOUR PLANTS (fertilizers) may be added directly to the soil or sprayed, as a solution, both on the soil and the plant. The three important available food elements are: nitrogen, for leaf growth; phosphorus, for flower production; and potassium, for stem strength. Trace elements are also necessary, but they vary from plant to plant type, in kind, and quantity. A one-half teaspoon of commercial fertilizer may be added to a two- or three-inch pot every two or three weeks. For a three- or four-inch pot a teaspoon full is a sufficient amount. For four- to six-inch pots a tablespoon full can profitably be added with the same frequency of application.

MIRACLE DRUGS are wonder workers; or wonder drugs work miracles. Pay and take your choice. Two of these are terramycin and aureomycin. Both are relatively non-toxic antibiotics. The first is derived from soil bacteria, the other from bread mold. Robert Ivan Zeman, R.Ph., Chicago, proprietor of the drug store a couple of blocks down the street, and the North Park College hang-out, has this to say about these drugs. "They make the treatment of pneumonia easier than that of a common cold." His two children, deep in the throes of scarlet fever, had temperatures immediately abated, with no deleterious after effects with aureomycin.

AUREOMYCIN, A REVIEW OF THE CLINICAL USES OF, 1951, Lederle Laboratories Division, American Cyanamid Company, 30 Rockefeller Plaza, New York 20. This monograph of 250 pages has a nine-page Clinical Index listing diseases which are discussed in its pages. The bibliography has 783 sources recorded. Leprosy and many of the other old toughies are discussed, on down to human bites. TOF thanks Mr. Zeman for a loan of the book and a look-see of interesting reading. It is the same aureomycin that made the headlines of magazines and newspapers a few months ago. Scientists were

putting aureomycin in the food of new-born pigs and they responded with accelerated weight increase and there was a remarkable decrease in pig mortality. The death rate of pigs reaches more than fifty per cent and has a national average of near thirty per cent. There is little reason that it is not a Miracle Drug.

MAKE A FAST BUCK by inventing. The National Inventors Council, Washington 25, D. C., has lists (sent to you free) which describes things needed to be invented. A cursory leer might reveal: a substitute for feathers; material for arctic gloves resistant to petroleum products; inexpensive converter of ice and snow into drinking water; wire splicers; adhesive for explosives; field produced foam filler for floats; and several hundred others. These are all technical problems affecting national defense which you or some one is going to invent. The things which are invented will play an important part in your life, and/or many other people like you who will use them. Write for the list of articles and their qualification-specifications; think; develop; invent. TOF sees no reason why practical biologists, who have had many survival experiences, would not be excellent advisors for inventing some of these items listed.

BIOLOGICAL COINAGES—ACTH (adreno-corticotrophic hormone) commercially from hogs, for treatment of arthritis, rheumatic fever and others . . . ANTIBIOTIC drugs produced from plant growth for infectious disease treatment, e.g., 1. aureomycin; 2. chloromycetin, specially treating typhus, also produced synthetically; 3. cortisone, similar to ACTH; 4. penicillin, a pale yellow powder, mold derived, most widely used antibiotic; 5. terramycin . . . BENTHOSCOPE hollow steel ball, for "Benthos" Greek for sea bottom, "Scope" to see . . . CLOUD SEEDING, scattering particles; dry ice, silver iodide, or water droplets into clouds, producing rain or snow . . . DDT (dichloro-diphenyl-trichloroethane) insect killer . . . DETERGENT a synthetic displacing our greatest commercial scrap fat supply . . . ELECTRON MICROSCOPE, photographing microcosmic structure with focused electron beams . . . GAMMA GLOBULIN, blood plasma extract, prevents measles contraction . . . GERIATRICS (no doubt too late for TOF, but he loves each one, God's blessing to them) study of needs and well-being of elderly people . . . HYDROPONICS, plant growth in chemical water solutions . . . IONOSPHERE, atmosphere thirty miles up . . . ORLON, synthetic fiber resembles both wool and silk . . . RADIOISOTOPE (radioactive isotope), activated atoms for physiology study . . . SMOG (smoke-fog), object of extensive research, sign-of-times, human and planimal habitat determiner . . . TRACER, one of many radioisotopes followed by biologists thru plant and animal structure, tagged atoms . . . ULTRASONIC, sound wave frequencies too high pitched for human auditory detection.

DECODE this pottage of garbled verbiage and wireless your comments with a three-cent stamp to THE OLD FOSSIL, 5061 North Saint Louis Avenue, Chicago 25, Illinois. ADDENDA: the junior member of the firm, Myrl Annette, 8A, who gets twenty-five cents per error proofreading this, states: "If the person that checks this does not pencil a couple in here, whoo-ee."

Biological Briefs

MERCER, FRANK L. Chlorophyll: Trends in Current Therapy. *The Science Counselor*, Vol. xv, No. 3, p. 101, September, 1952.

Chlorophyll has been found to possess therapeutic values. This paper deals with the pharmaceutical and medicinal application of water-soluble chlorophyll products, chlorophyllins.

In recent years, the use of chlorophyll for medicinal purposes has been widely publicized. It has been used to treat chronic suppurative conditions, to accelerate healing, to treat leg and peptic ulcers, and to reduce odors. Present evidence indicates that chlorophyll enhances tissue resistance by an effect on the normal repair mechanism.

"Chlorophyll administered to human beings and animals either topically, orally, or parenterally appears to be non-toxic, and free of side reactions."

"Westcott, 1950, concluded that chlorophyll is non-toxic and that it effectively neutralizes mouth odors, perspiration odors, and many urine odors. Tebrock, reported an effectiveness of 84% in the control of breath and perspiration odor when 200 mgm. of specially prepared chlorophyllins were administered daily. One difficulty encountered in deodorant studies is the measurement and standardization of odors."

Many new products containing chlorophyll have been marketed. They included a medicinal spray-bomb, mouth washes, tooth pastes, soaps, shampoo, cigarettes, and gum.

Twenty-seven recent literature citations are included.

NEWMAN, ROBERT J. Wings Across the Moon. *Audubon Magazine*, Vol. 54, No. 4, July–Aug., 1952.

Six years ago George H. Lowery, Jr., Curator of Louisiana State University Museum of Zoology began trying to find out whether any birds return-

ing from Central America fly directly across the Gulf of Mexico or whether they detour around it. The study was being conducted by recording the number of birds (silhouette) and their line of flight across the moon, as observed by use of a telescope or binoculars. The counts, made with the telescope, were used to determine mathematically the probable number of birds per hour crossing a one-mile line on the earth's surface.

From such observations surprising things have been discovered. The nocturnal flights, unlike the daytime flights, tend to be made up of small groups of migrants rather than flocks. Also, the migrants tend to ride the prevailing wind currents. Migrants seem to rest shortly after sunset, reach peak abundance about mid-night, and drop to earth again to rest shortly before dawn. These observations have been made in the spring in central and southern United States.

"The observational procedure is very simple; anyone can participate. Perhaps some one in your area is already planning to cooperate in this project. If no one in your community knows about this project, you may find out what to do by writing to the Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana, for a mimeographed pamphlet *Studying Noctural Bird Migration by Means of the Moon.*"

Ted F. Andrews,
State Teachers College,
Emporia, Kansas

Most Amazing Mail Order House!

This is the title of an article by Don Morris in the November issue of *Pageant Magazine*. The subhead says "Need amoebae, whale eyes or an embalmed cat? Turtox has them." The article starts out as follows: "If you should happen to run into a *Gratemys geographica* tonight, don't run to the nearest exist. Write a fast note to the General Biological Supply House in Chicago and find out if it is still looking for one." It then goes on to describe the strange business carried on by the firm with which the readers of *The American Biology Teacher* are so familiar, the Turtox ads having been among the most common throughout the life of the journal.

The journal of the firm is thus described: "*Turtox News*, a little monthly magazine, devotes a considerable amount of space to free want ads. When even GB's own collectors give up, *Turtox News* readers have been able to help each other out by locating such unusual desiderata as Australian lungfish, whale embryos, parasites infecting the king cobra and radioactive snails." Even the history of General Biological is included; the article relates how Dr. Morris M. Wells, a University of Chicago zoologist, grew his own cultures for his classes and started supplying his students as they graduated and began teaching themselves. This activity soon mushroomed into a business that took all of Dr. Wells' time.

Better get a copy of the November *Pageant* and read for yourself the fascinating description of the firm that has been one of our most loyal boosters from the beginning of our organization.

Ten Years Ago

In 1942 *The American Biology Teacher* had a column called *By The Way;* it consisted of paragraphs contributed by readers. In some respects it was like the present Biology Laboratories column. It may be of interest to see what some of the items from the December 1942 issue were, so here they are:

BY THE WAY

Don't Neglect Field Work in the fall and early winter. The ponds and roadside ditches will furnish dozens of species of crustacea, aquatic insects, insect larvae, algae and the like; the woods have insect galls, lichens, seed pods and so forth; last summer's bird nests are still in good condition; although not quite so obvious, there is as much of biological interest as in spring or summer.

Before You Forget, go out and pick up a handful of dry grass and leaves, put them in a pint or quart jar of water and set the infusion in a window where some direct sunshine will reach it; you will soon have a fine collection of microorganisms.

When the Trees Have Shed their leaves, it is time to start the study of *winter twigs.* With a little practice trees can be identified by their twigs almost as easily as any other way. Note especially the size, shape, color, surface and arrangement of the buds.

Vallisneria, or "eel grass," is one of the best winter aquarium plants. It is a good oxygenator, grows rapidly, presents a good general appearance and thrives under a wide variety of conditions.

An Aquarium does not have to be a large tank. A common fruit jar has ample size for snails, leeches, small crustacea, water insects, cultures of algae and many other kinds of plants and animals.

To Mount Butterfly Wing Scales in their original pattern, coat a slide with balsam, varnish or lacquer; press the wing down on the sticky surface and remove it at once; allow to dry and mount in balsam in the usual way.

The St. Louis Meeting

Convention Headquarters: Parlor A, Hotel De Soto, December 27–30

SATURDAY MORNING, DEC. 27

8:00 a.m.; Parlor A, Hotel De Soto; *Meeting of Board of Directors.*

8:30 a.m.; De Soto Room, Hotel De Soto; *Presentation of Science Teaching Films;* **Joint session of NABT, NSTA, and ANSS,** Arranged by James M. Sanders, Chicago Teachers College.

10:00 a.m.; De Soto Room, Hotel De Soto; *Implementation of Basic Principles of Good Teaching;* **Joint session of NABT, NSTA, and ANSS,** Roger Tory Peterson, *Presiding.*

SATURDAY AFTERNOON, DEC. 27

2:00 p.m.; De Soto Room, Hotel De Soto; *Implementation of Objectives with Retarded and with Superior Science Students;* **Joint session of NABT, NSTA, and ANSS,** Harold E. Wise, *Presiding.*

SATURDAY EVENING, DEC. 27

6:00 p.m.; Cotillion Room, Hotel De Soto; *Banquet of the Science Teaching Societies: NABT, NSTA and ANSS,* Norman R. D. Jones, Southwest High School, St. Louis, *Chairman.*

8:00 p.m.; De Soto Room, Hotel De Soto; *ANSS Presidential Address:* European Bird Adventures. Illustrated. Roger Tory Peterson, Glen Echo, Maryland.

9:30 p.m.; De Soto Room, Hotel De Soto; *All-Societies Mixer.*

SUNDAY MORNING, DEC. 28

9:00 a.m.; Lobby of Hotel De Soto; *Department of Joint Field Trip;* Jointly sponsored by National Association of Biology Teachers and American Nature Study Society, David Jones, *Chairman.*

Will leave from Locust Street entrance. Trip to Mississippi and Missouri River flood plains. (To observe rapid ecological adaptations to sudden habitat changes due to river action.) **Open to all interested persons.** Cost per person, $3.50, includes transportation by bus and lunch. Reservations *must* be in by noon, Saturday, Dec. 27. Leaders: Earl Comfort, Rex Conyers, Marshall Magner, Charles E. Mohr, E. Laurence Palmer, Roger Tory Peterson, Richard L. Weaver.

SUNDAY AFTERNOON, DEC. 28

1:30 p.m.; Parlor D, Hotel De Soto; *Identification of Talented Youth in Science and Mathematics;* **Joint session of the AAAS Cooperative Committee on the Teaching of Science and Mathematics, the NABT, NSTA, and the ANSS.**

SUNDAY EVENING, DEC. 28

8:00 p.m.; Parlor A, Hotel De Soto; *Meeting of the Board of Directors.*

MONDAY MORNING, DEC. 29

8:00 a.m.; Parlor A, Hotel De Soto; *Meeting of Editorial Board of* The American Biology Teacher.

8:30 a.m.; De Soto Room, Hotel De Soto; *Presentation of Science Teaching Films.*

10:00 a.m.; Gold Room, Hotel Jefferson; *Session,* Brother H. Charles, F.S.C., St. Mary's College, Winona, Minnesota, *Presiding.*

1. Objectives and Services of the American Institute of Biological Sciences. Samuel L. Meyer, Executive Director, American Institute of Biological Sciences.
2. Some Aspects of Natural History Teaching in the Great Basin of Utah. Stanley Mulaik, Instructor in Natural History, University of Utah.
3. Flightless Birds of New Zealand, Extinct and Near Extinct. Katherine V. W. Palmer, Director, Paleontological Research Institution, Ithaca, New York.
4. College Science Teaching: Its Present Status and Its Improvement. Harry J. Fuller, Professor of Botany, University of Illinois.

MONDAY NOON, DEC. 29

12:30 p.m.; Hunt Room, Hotel De Soto; *Luncheon.*

Speaker: Elvin C. Stakman, University of Minnesota.

MONDAY AFTERNOON, DEC. 29

2:00 p.m.; De Soto Room, Hotel De Soto; *Session;* **Joint program of National Association of Biology Teachers and National Association for Research in Science Teaching,** Harvey E. Stork, *Presiding.*

1. Content of Two College General Education Science Courses. Ernest E. Snyder, Associate Professor of Science, State Teachers College, Florence, Alabama.

2. Training and Professional Opportunities for Women in the Natural Sciences. DOROTHY ALFKE, Assistant Professor of Education, Pennsylvania State College.
3. Pilot Studies in the Use of Visual Aids in the Teaching of High School Biology. KENNETH E. ANDERSON, Director, Bureau of Educational Research and Service, School of Education, University of Kansas.
4. Biology Clubs as Teaching Tools. ROBERT SMITH, Instructor of Biology, De Kalb High School, De Kalb, Illinois.
5. National Association of Biology Teachers Survey of Health Content and Needs in High School Biology. BETTY LOCKWOOD WHEELER, Mount Pleasant, Michigan, CLIFFORD KNAPP, Gallatin County High School, Bozeman, Montana, and SISTER CLARETTA, Trinity High School, River Forest, Illinois.

MONDAY EVENING, DEC. 29

8:00 p.m.; Parlor A, Hotel De Soto; *NABT Membership Committee Meeting.*

TUESDAY MORNING, DEC. 30

8:00 a.m.; Parlor D, Hotel De Soto; *Meeting of the Officers of NABT, NSTA, and ANSS to plan the 1953 coordinated program of the Science Teaching Societies affiliated with the AAAS.* All interested persons are invited.

8:30 a.m.; De Soto Room, Hotel De Soto; *Presentation of Science Teaching Films.*

10:00 a.m.; De Soto Room, Hotel De Soto; *Meet the Authors of Science Texts and Reference Books;* **Joint session of NABT, NSTA, and ANSS,** HARVEY E. STORK, *Presiding.*

Attention is also called to the book panels of the Society of Systematic Zoology; Three College Biology Texts, Monday afternoon, Dec. 29; and Three College Zoology Texts, Tuesday afternoon, Dec. 30.

(*Continued on page 225*)

HEALTH BULLETIN FOR TEACHERS

"Many of the qualities called for in democratic living are associated with health. An emotionally healthy person has a profound sense of personal worth combined with a lively sense of responsibility toward others. Without a wholesome respect for the individual and the ability to plan and work with other individuals for the common good, democratic human relations would be impossible. A mentally healthy person uses reason as a guide in acting. Without the steadying hand of reason to oppose the shifting waves of impulse, a democratic ship of state would quickly flounder. And no nation could long survive without a substantial proportion of physically healthy young people capable of sharing in the productive life of their communities and, if need be, coming to the defense of their country."

The foregoing is quoted from the November 1951 *Health Bulletin for Teachers*, published by the Metropolitan Life Insurance Company of New York. The company has a school health bureau in its division of health and welfare. Teacners may obtain the bulletins free of charge by writing Metropolitan.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY ACTS OF MARCH 3, 1933, AND JULY 2, 1946

Of *The American Biology Teacher*, published monthly October to May, inc. at Lancaster, Pennsylvania.

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher: SCIENCE PRESS, Lancaster, Pennsylvania.

Editor: JOHN BREUKELMAN, Emporia, Kansas

Managing Editor: Muriel Beuschlein, 6431 S. Richmond, Chicago 29, Ill.

Business Manager: *none.*

2. That the owner is:

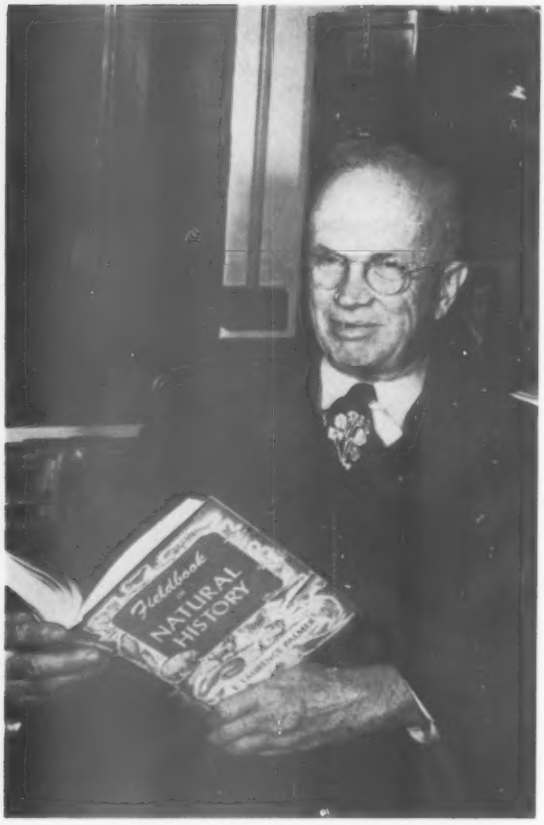
THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company; also that the said two paragraphs contain statements embracing affiants full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear on the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN BREUKELMAN,
Editor



E. LAURENCE PALMER

Dr. Palmer, who was the 1947 president of THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS, retired in July, after 33 years of teaching nature and science education at Cornell University.

Over the country at large and especially to members of NABT he is perhaps best known as a prolific writer, the total of his publications being nearly 500. He has written scientific and popular articles, books, educational leaflets, and scenarios for teaching films. He has been active in publication not only as an author but also as an editor, now holding editorial positions with at least four publications; perhaps best known to teachers are the *Cornell Rural School Leaflets* and the central inserts in *Nature Magazine*.

Dr. Palmer is an active member of many scientific and educational organizations and has held high offices in most societies to which he belongs. Throughout his adult life he has been a leader in the field of science education; he looks upon his retirement as an opportunity to undertake new projects which his teaching schedule has prevented. We shall expect to see him at many more NABT meetings and to hear from him frequently. He and Mrs. Palmer will continue to live at 206 Oak Hill Road, Ithaca, New York.

Student Suggestions and Ratings

upon different sections of an introductory course in general biology

C. E. ROSENQUIST
University of Nebraska, Lincoln, Nebraska

INTRODUCTION

After a number of teaching semesters have rolled by one wonders what student reaction may be and above all what improvements the students may have in mind. A questionnaire was designed which would allow students to express their opinions about course emphasis and to include suggestions. The students were not required to sign the questionnaire. It was emphasized that honesty was required above all. The questionnaire was filled-in by the fall and spring classes of 1948 and the spring classes of 1949. In each case it was presented to the students during the last class period of the semester. Thus students had the experience of at least one full semester in the university beforehand. Many, however, were upperclassmen at the time. Of the 373 students involved one was a graduate, 5 were seniors, 37 juniors, 75 sophomores and 255 freshmen. Eighty-nine of these were girls and 284 were boys. The course carries 5 semester hours of credit and is repeated each semester.

EMPHASIS ON TOPICS

One of the divisions of the questionnaire carried the caption "What emphasis would you prefer on the following:" A list of divisions of the course was then given together with columns for checking the emphasis under the heading of "more, same, less." Table I

TABLE I.

Emphasis on topics of a course in beginning biology obtained by having students indicate after each topic whether more, the same, or less emphasis should be placed on it.

Topics	Number of answers in favor of:			Ratio more to less emphasis	Per cent class time used per topic
	More emphasis	Same emphasis	Less emphasis		
1. History of biology	20	284	64	1/3:1	5
2. Physical and chemical principles	90	230	48	2:1	3
3. Protoplasm	35	288	45	1:1	5
4. Cells, tissues, and organs	98	225	45	2:1	9
5. Nutrition	109	192	67	1 1/2:1	23
6. Stimulus and response	68	245	55	1:1	17
7. Reproduction	180	178	10	18:1	11
8. Heredity	207	135	26	8:1	9
9. Evolution	106	176	86	1:1	7
10. Behavior	138	193	37	4:1	4
11. Pathology	154	181	33	5:1	5
Totals	1,205	2,327	516		100

shows the judgment of the students regarding the topics included together with the percentage of time spent on each topic as a measure of emphasis actually given.

Among the 373 returns there were a possible 4,103 marks or votes which could be cast in favor of more, same or less emphasis. These votes were cast thus: 1,205 for more emphasis on some parts, 2,188 for the same emphasis and 516 for less emphasis. Five students did not fill in the emphasis part of the questionnaire.

One of the first considerations in a study of this kind is whether or not the students seem to be satisfied with things as they are. The "same emphasis" column in a large measure should indicate satisfaction especially where a "vote" is required to register satisfaction. Votes in this column constitute votes for no change. As a whole they show a considerable satisfaction with the emphasis as it is at present. The overall total of 2,327 votes is considerably more than the 1,721 votes which represent the total number of votes for more and less emphasis.

But when the topics are treated separately certain variations come to light, showing a greater number of votes for change than against some kind of change. If we express this situation in actual numbers, change to no change, the following is what we have: heredity 233 : 135; evolution 192 : 176; reproduction 190 : 178; pathology 187 : 181. Two other topics come near to falling in the above category. They are: nutrition 176 : 192 and behavior 175 : 193. All of the above mentioned topics, except evolution and nutrition have a preponderance of votes in favor of more emphasis. The column in Table I "Ratio more to less emphasis" shows this fact clearly. Taking the topics in the same order as above we have: heredity 8 : 1; evolution 1.2 : 1; reproduction 18 : 1; pathology 5 : 1; nutrition 1.6 : 1; behavior 4 : 1.

Preference as a Measure of Interest

Preference for a change indicates some dissatisfaction with the course as given while preference for more emphasis on some topics should indicate more interest in that phase of the course. We should thus be able to class as satisfactory those topics which show a preponderance of votes for no change. These are: history of biology; physical and chemical principles; protoplasm; cells, tissues and organs; stimulus and response. The conclusion that more emphasis should be placed upon the topics of heredity, reproduction, pathology and behavior in this course, seems obvious. Evidently a student is more interested in topics which may affect him most directly. Though a large percentage of students preferred a change in emphasis on evolution and nutrition there was little agreement

on more or less emphasis. Possibly a different approach would be welcomed here.

Students Have Suggestions

A space was left in the questionnaire for suggestions. Of the 373 returns about one-third (126) had no suggestions. Some students had several; most were satisfied with one. The suggestions were classified as well as possible into several groupings. These are listed in Table II.

TABLE II

Types of suggestions

	Frequency
1. No suggestions	126
2. Appreciative (27) plus satisfied (14)	41
3. Semi-weekly exams not adequate	33
4. Simplify or shorten course	27
5. Revise or improve labs	24
6. Provide a syllabus for course	20
7. Give more time for explanation	19
8. Make course more practical	18
9. Too much memory work	16
10. More Movies	13
11. Use a different text	12
12. Have exams on set days or give warning	10
13. Teach less or no evolution	9
14. Give more subjective type exams	7
15. Course too difficult	7
16. Distribute a list of important questions for study	6
17. Criticism of instructor	6
18. More use of text	5
19. Exams too difficult	5
20. More exams	5
21. More review	4
22. The class is too large	4
23. More field trips	4
24. Biology should not be required	3
25. Miscellaneous (4 pairs of suggestions plus 15 unclassified)	23

Suggestions showing appreciation or satisfaction, if combined, were the most numerous. The next suggestion (no. 3) will need some explanation. The semi-weekly examinations referred to were all multiple choice type. It was obvious that the students were convinced that this type of exam did not adequately test their knowledge of the subject. Some were in favor of substituting essay type and written objective type exams, partially or completely, as shown by suggestion 14. The suggestion to simplify or shorten the course is also quite valid. A general course in biology is very broad yet includes much specific material. It is difficult for the student to adequately assimilate all of it or to decide which to emphasize. Closely correlated with this topic is the suggestion that a syllabus be provided for their use as well as the criticism that there is too much memory work involved. Suggestion 7, that more time should be given to explanation, is undoubtedly involved in the above group as may be suggestions 15 and 21. The suggestion (number 8) regarding making the course more practical is worth some serious thought. Possibly almost any sort of emphasis which would arouse more interest in biology would be justified.

Students making no suggestions seemed to be slightly more satisfied with the course as given, while those making suggestions are more interested in some sort of change in emphasis as shown in Table III.

Summary and Conclusions

Three hundred and seventy-three students returned completed questionnaires regarding content of and topic interest in a beginning course in college biology. Of the above students 284 were boys and 89 girls; two-thirds were freshmen. About one-half of the students seemed to be satisfied with the present emphasis given each topic but of those who wished a change seventy per cent were in favor of more emphasis and this preference was centered mostly upon four of the eleven

TABLE III

Emphasis on parts of the course in biology. Students giving suggestions versus students giving no suggestions.

Group	Number of students	Average number of marks for emphasis per student		
		More emphasis	Same emphasis	Less emphasis
Suggestions	225	3.27	5.60	1.56
No suggestions	148	3.18	6.20	1.22

topics. These were in order of preference: reproduction, heredity, pathology and behavior.

If the desire for more emphasis upon certain topics in biology can be interpreted as greater interest in those parts of the course, one may conclude that students desiring any increase in emphasis prefer the emphasis to be upon topics of much personal importance.

Suggestions, 447 in number, were listed by 225 students. Many of these were highly constructive and all should be considered in an analysis of the course. After reading the abundant suggestions ranging from poor to excellent and including criticisms, one feels the weight of the idea that college students should have opportunity to exercise some influence upon the content and presentation of college courses. Faculties may take this thought into consideration when revising existing courses or initiating new ones.

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The St. Louis Meeting

(*Continued from page 221*)

TUESDAY AFTERNOON, DEC. 30

2:00 p.m.; Parlor D, Hotel De Soto; *Panel Discussion: Effective Techniques in Teaching Conservation in Biology,* RICHARD L. WEAVER, University of Michigan, *Presiding.*

Panel Members: HOWARD E. WEAVER, Texas Forest Service, College Station, Texas. EARLE EMERSON, Coalgate City Schools, Coalgate, Oklahoma. SAM P. HEWITT, State College, Warrensburg, Missouri. C. W. LANTZ, Iowa State Teachers College, Cedar Falls, Iowa. DON Q. MILLIKEN, Kansas State Teachers College, Pittsburg, Kansas. ADRIAN FOX, U. S. Soil Conservation Service, Lincoln, Nebraska. GORDON N. BENDER, State Teachers College, Bemidji, Minnesota.

Summary: HOWARD MICHAUD, Purdue University, Lafayette, Indiana.

TUESDAY EVENING, DEC. 30

8:00 p.m.; Parlor D, Hotel De Soto; *Meeting of the National Conservation Committee,* RICHARD L. WEAVER, Michigan School of Natural Resources. Open to anyone interested.

WEDNESDAY MORNING, DEC. 31

9:00 a.m.; Parlor D, Hotel De Soto; *Conservation Work Conference,* RICHARD L. WEAVER, *Presiding.*

1. Development and Expansion of State Plans for Conservation Project.
2. Reports of State Teams. STATE CHAIRMEN.
3. Summary of Project Plans. RICHARD L. WEAVER.

Books

SMITH, GILBERT M., Editor. *Manual of Phycology, An Introduction to the Algae and Their Biology.* The Chronica Botanica Co., Waltham, Mass. XI + 375 pp. illus. 1951. $7.50.

This book, designed both for the phycologist and for the botanist who is not primarily interested in algae but who is familiar with a representative series of forms, follows the current practice of including among the algae those holophytic organisms that, until relatively recently, were treated only by the protozoologist. Following a short history of phycology, Dr. Smith gives the position of the algae in the plant kingdom and the characteristics of the seven divisions. Each division is written by a separate author, and, although differing somewhat in the manner or organization of his material, each author discusses the structure, reproduction, and classification of his group. Each chapter is well illustrated and contains an extensive bibliography.

In addition there are several chapters, devoted to the general biology of the algae, mostly not covered in existing treatises. Chapters on Microtechnique, Methods for the Cultivation of Algae, Ecology of Marine Algae, Cytology of Algae, Sexuality of Algae, and Physiology and Biochemistry of Algae make this a valuable reference book for those interested in algology.

CHARLES C. HERBST,
Beverly Hills High School,
Beverly Hills, California

McDOUGALL, W. B., and SPERRY, O. E. *Plants of Big Bend National Park.* U. S. Government Printing Office, Washington. XII + 1–209 pp. 190 figs. 1951. $1.00.

An excellent and helpful work for both the amateur and professional botanist. The figures, except for a few line drawings in the beginning to aid the amateur, are half-tone photographs, and are good. There is a key to the families of the Pteridophytes and Spermatophytes, and, in general, there are keys to genera and to species if several are involved.

In an area as large and complex as the park, new records are certain to be found. This is especially true for weedy plants along the Rio Grande flood plain. Unless the collector is there the right year, and between floods, certain plants cannot be found. Two species of *Rorippa*, two more genera of the Umbelliferae (*Apium* and *Ammoselinum*), *Gilia longiflora*, *Veronica peregrina* var. *xalapensis*, and *Evax* are among the plants we have at hand not recorded by the authors.

The authors are to be praised for writing this flora. Professional botanists will welcome it for dealing with an area far removed from regions well covered taxonomically. Though the authors may be too optimistic in believing that even an amateur will be able "to identify accurately and determine the name of any plant he may find in the park," the amateur will be able to identify enough of them to add to his enjoyment of this scenic area.

GEORGE J. GOODMAN,
University of Oklahoma,
Norman, Oklahoma

KIRBY, HAROLD. *Materials and Methods in the Study of Protozoa.* University of California Press, Berkeley and Los Angeles, California. x + 72 pp. $2.50.

This is a valuable book for the beginning Protozoologist. The techniques explained are mostly for securing, maintaining and making preparations of protozoa for observation. There are three sections of this cardboard-covered book, page size 11 × 8½ with references at end of each section. The first seventeen pages deals with collection and cultivation methods for free-living protozoa. Culture media recipes are given alphabetically form Agar to Zumstein media. The second section, ten pages, is devoted to collection and cultivation methods for symbiotic protozoa. Third is the twenty-nine-page section devoted to technical methods of study and preservation ranging from aceto-carmine stain thru Fixation fluids, Haematoxylin staining to Wright stain. A complete eight-page index is found at the end of the book.

M. A. RUSSELL,
Highland Park Junior College,
Highland Park, Mich.

MARTIN, GUSTAV J. *Biological Antagonism—The Theory of Biological Relativity.* The Blakiston Co., Philadelphia 5, Pa. vii + 516 pp. illus. 1951. $8.50.

The author presents authoritatively, completely, and concisely the concept of biological relativity, as based upon an extensive study of biological antagonisms and as seen in and related to amino acids, hormones, minerals, purines, enzymatic structure and action, pyrimidines, and vitamins. He relates such a basic concept to the fields of chemotherapy, immunology, and pharmacology. The coverage of the whole study of metabolite analogues is thorough and complete, and yet concise enough as to make the book an excellent reference work for research students and investigators in the fields of chemotherapy, immunology, pharmacology, and medicine. The over 1900 references are carefully selected and arranged, and represent a complete survey of pertinent literature. The index is quite comprehensive and well arranged. The text matter includes 64 figures and 44 tables.

B. BERNARR VANCE,
Sinclair College,
Dayton, Ohio

YOUNG, J. Z. *Doubt and Certainty in Science.* Clarendon Press, Oxford. VIII + 168 pp. illus. 1951.

The author, in eight lectures comprising the Reith Lecture Series for 1950 and comments thereupon, presents a simple, clear explanation of the phenomena of brain and nerve functioning. He does this by comparison with computing machines, "mechanical brains." No other subject illustrates

so admirably the relationship between doubt and certainty—a most appropriate title for the booklet.

Professor Young describes the higher activities of man (scientists) by considering the brain processes that produce them. Communication is essential to cooperation between individuals and dominates all man's actions—speaking habits and other behavior patterns. The brain does this by building up a series of rules, which act as models for the brain when it deals with new events. Models of communication have a historical pattern, which is brought out by the author in tracing the changing concepts in science; i.e., "matter and forces" have been gradually replaced by those of "relative motion and energy." Appropriate photographic and sketch illustrations make the explanation quite meaningful. The booklet has value as a reference in psychology and biology besides being of interest to the general reader.

ELMO N. STEVENSON,
Southern Oregon College of Education, Ashland, Oregon

BULLOUGH, W. S. *Vertebrate Sexual Cycles.* John Wiley & Sons, Inc., New York. viii + 117 pp. 1951. $1.50.

This little book is written by a research fellow of the Royal Society of London, for the non-specialist, and published as one of Methuen's Monographs on Biological Subjects. It deals with the two best known sexual cycles—the long seasonal or yearly cycle found in vertebrates of all classes and the short oestrus cycle of female mammals. The author attempts to summarize the knowledge gained during the past generation or so on the interactions of the numerous and complex factors affecting these cycles. Although great advances have been made, he admits that much research remains to be done. The book is documented with a literature list of 203 titles.

Facts are given to show that seasonal cycles are especially subject to the external environment, light in particular, acting upon the nervous system, and through it upon the pituitary gland, whose hormones in turn affect the gonads. For example, autumn-breeding sheep were taken from England to South Africa. The ewes lambed after arrival in January. When the southern autumn began in March they came into heat and were mated in May. Thereafter they bred only in the southern autumn. Similar reversals are cited in other mammals. Increasing or decreasing daylight is the effective stimulus.

Oestrus cycles are primarily genetic in that each species of mammal has its own inherent periodicity. The physiological mechanism here also involves the pituitary gland and the nervous system acting upon the gonads. Man seems to be a peculiar species in showing the widest variation in time of ovulation within the cycle, although within the individual this time is regarded as fairly constant.

There is a glossary, a list of 112 species mentioned, and an index. The book is recommended as stimulating reading for the student in general biology or zoology.

EDWARD C. COLIN,
Chicago Teachers College, Chicago, Illinois

A Proof Book of Forestry Ad Mats, available free from the American Forest Products Industries, Inc., 1319 Eighteenth Street, N.W., Washington 6, D. C.

Twenty-eight different ready-made ads can be varied to fit a local situation and may be used by any type of business organization which advertises. These are powerful conservation education aids at a high level of advertising skill and public appeal. Every publisher or printer in every community should be using them. They are helpful at any teaching level.

RAUSHENBUSH, STEPHEN (editor). *The Future of Our Natural Resources.* 1952, The Annals of the American Academy of Political and Social Science, Volume 281, Philadelphia.

This is a symposium published by a galaxy of glittering names in the wide fields of conservation. It is the most comprehensive over-all picture of the problems of conservation in all phases which has ever been published. Familiarity with the subject matter of this volume is indispensable for anyone who seeks to project his comprehension of natural resource requirements into the future. It offers the most adequate basis for understanding conservation education yet published.

JAMES M. SANDERS,
Chicago Teachers College, Chicago, Illinois

BAER, MARIAN E. *Sound—An Experiment Book.* Holiday Press. 126 pp. 1952. $2.50.

The varied and bewildering sounds in our everyday life are given clearer meaning in this book of interesting experiments for older children. The book is easy to read, the experiments easy to per-

form with simple items in the home, and the principles well presented for better understanding. Skill has been used in the arrangement of the material and the development of the concepts: sound is vibration, it travels and bounces, it can be made louder or softer, high or low.

Included in this volume are instructions for making two musical instruments, a simple xylophone and a monochord, a short summary or review, and a useful index. Much of this material can readily be adapted for classroom presentation of a unit on sound for middle and upper grades.

Correlation of Elementary and Junior High School Science Filmstrips. Published by Jam Handy Organization, 2821 E. Grand Blvd., Detroit 11, Michigan. Free.

This is an easily interpreted book-like chart which shows at a glance the available filmstrips from this organization which are correlated to subject matter in the thirteen leading science text series. Page references in each textbook are given for each of the thirty-four filmstrips of the five series which include material on health, sky, earth, water and birds. This chart can also be used for locating related material in the various series of science texts for supplementary use.

Poole, Lynn. *Today's Science and You.* Illustrated by Jeanne Bendick. McGraw-Hill Book Co., Inc., N. Y. 197 pp. 1952. $2.75.

Teen-agers, living in "this age of unprecedented interest in science" can build a foundation for understanding the discoveries and developments by which today's scientists are striving toward the solution of the many perplexing problems of living. In this interesting book they can get some realization of the limitless horizons of scientific research and its promise for the future. Among the topics discussed are isotopes, trace elements, rockets and television.

Written in language the lay person can understand, this collection of stories have been adapted from the Johns Hopkins Science Review by the producer of that series of television shows.

Muriel Beuschlein

Hall, Thomas S. *A Source Book in Animal Biology.* McGraw-Hill Book Co., New York. XVI + 716 pp. 1951. $10.00.

The two aims of this book are "to increase the general availability of the classical contributions to animal biology and to present the development . . . in the words of those who produced it." Papers by Da Vinci, Linnaeus, Goethe, Harvey, Galvani, Pavlov, Lamarck and more than 100 others of the founders of animal biology are assembled, in English, with an editor's comment on the significance of each. There are eight groups of papers: Organization of Animal Life, Activities of the Animal Organism, Basis of Animal Behavior, Origin and Development of the Individual, Cellular Biology, Pathology, Evolution and Hereditary, Zoogeography. The index is exceptionally well organized.

John Breukelman,
State Teachers College,
Emporia, Kansas

FILMS

The rabbit (black and white, sound, 11 minutes); food, structures, habitat and characteristic movements, reproduction, care and development of young.

The rabbit's development (black and white, sound, 29 minutes); examples of sexual reproduction in sea urchin, trout, frog, hen and mammal; animation compares rabbit egg with that of hen, dissection of rabbit to show female reproductive tract; embryo at 10, 12, 14, 16, 18, 20, 24, 28 and 30 days and young at one, two, three and four weeks of age.

The newt (black and white, sound, 10 minutes); types of newt, life cycle, growth of tadpole, habitat, hibernation and ecology. Animated drawings describe reproductive processes.

The onion (black and white, sound, 11 minutes); magnified view of seed showing embryo, growth processes shown by time-lapse photography, development of roots and leaves from bulb, pollination, fertilization, formation of flower head.

Pin mold (black and white, sound, 10 minutes); mold growth on cheese, apple and oatmeal, formation of sporangia, time-lapse photography of protoplasmic activity and growth; fusion of plus and minus strains, formation of zygospore, germination.

Vegetable insects (color, sound, 23 minutes); close ups of potato beetles, aphids and other common garden insects, showing structures, habits, habitats and other features, in relation to the various methods of control.

The above films are available from the *International Film Bureau,* 6 North Michigan Avenue, Chicago 2, Illinois.

Biology In The News

What to Do for a Sick Friend by Martin Bunn, *American Mag.*, Nov. 1952, pp. 30–31 & 105–107.

Does your ignorance or your thoughtlessness increase the discomfort of the sick persons you visit? This article can serve as an effective guide for those who really want to help the sick.

The World's Most Important Mice by J. D. Ratcliff, *Colliers*, Nov. 8, 1952, pp. 13–15.

Research with mice gives many clues to the inheritance of many diseases and to the environmental conditions which bring about cancer, heart trouble and several other diseases which afflict man.

So He Took the Cobra Venom and Shot It into His Arm by Bill Davidson, *Colliers*, Nov. 1, 1952, pp. 52–55.

An account of the chances scientists deliberately take to prove their theories and to advance medical science.

Why Not Shoot Them? by Milton H. Stenlund, *Outdoor Life*, Nov. 1952, pp. 50–51 & 102.

How many deer should be killed each year? Opinions differ greatly but certainly present game laws favor overpopulation and death by starvation.

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